

What is claimed is:

subA'

1. A vertical heat exchanger comprising:
a pair of a first fluid passing ports for flowing
5 through a tube;
a pair of a second fluid passing ports for flowing
through a shell;
a vent ²⁰⁶pipe at least part of one end of which being made
of an upper tube sheet ^{208, 212}part and the other end of which
10 connected outside the heat ²⁰¹exchanger to an immediately
adjacent second fluid passing port passing the same fluid as
the vent; and / or
a drain ¹⁰⁰⁷pipe at least part of one end of which being
made of a lower tube sheet part and the other end of which
15 connected outside the heat exchanger to an immediately
adjacent second fluid passing port passing the same fluid as
the drain.
2. A heat exchanger according to claim 1, wherein a
20 diameter (D) of the shell of the heat exchanger, a diameter
(d) of the vent pipe, and a number (N) of vent pipes satisfy
the formula, $D/(d \times N) = 10 - 60$.
3. A heat exchanger according to claim 2, wherein the
25 diameter (D) of the shell of the heat exchanger, the diameter
(d) of the vent pipe, and the number (N) of vent pipes
satisfy the formula, $D/(d \times N) = 10 - 40$.
4. A heat exchanger according to claim 1, wherein a
30 position of the outlet of a pipeline combined of the vent
pipe with the second passing port is higher than that of the
upper tube sheet of the heat exchanger.

09705351 110300

of a shell-and-tube heat exchanger and a spiral heat exchanger, wherein the upper tube sheet corresponds to an upper cover in the case of a spiral heat exchanger and the lower tube sheet corresponds to a lower cover in the case of the spiral heat exchanger.

Sub A² 9. A method for introducing or discharging part or (the whole) of the second fluid through a drain pipe and/or a vent pipe set forth in claim 1.

10

10. A method according to claim 9, wherein one of the first and second fluids is an easy polymerizable substance.

11. A method according to claim 10, wherein the other fluid is water.

Sub A³ 12. A method according to claim 10, wherein (the polymerizable material) is at least one member selected from the group consisting of acrylic acid, methacrylic acid, an acrylic ester, a methacrylic ester, an aqueous acrylic acid solution and an aqueous methacrylic acid solution.

13. A method for introducing or discharging part or the whole of the second fluid through a drain pipe and/or a vent pipe set forth in claim 6.

14. A method according to claim 13, wherein one the first and second fluids is an easy polymerizable substance.

15. A method according to claim 14, wherein the other fluid is water.

16. A method according to claim 14, wherein the polymerizable material is at least one member selected from the group consisting of acrylic acid, methacrylic acid, an acrylic ester, a methacrylic ester, an aqueous acrylic acid solution and an aqueous methacrylic acid solution.

Add A4

00705351 110300